REMARKS

This document is filed in response to the Final Office Action dated October 15, 2010 ("Office Action").

Applicant has amended claims 34 and 50 to limit the moisture content of the substrate to less than 15%. Support for the amendment appears throughout the specification, for example, at page 28, lines 26-27. Applicant has also canceled claims 66-85 without prejudice. Lastly, Applicant has amended the specification to rectify an inadvertent and apparent error.

Applicant submits that the above-proposed amendments would place the claims into condition for allowance, and would not raise new issues or require any additional searching. They would at least present the rejected claims in better form for consideration on appeal. Therefore, **Applicant requests that the proposed amendments be entered after the final rejection under 37 C.F.R. § 1.116.**

Claims 1-31 were previously canceled. Upon entry of the above proposed amendments, claims 32-65 will be pending. Applicants respectfully request that the Examiner review the following remarks and reconsider the application.

Specification

The Examiner points out certain apparent inconsistency that appears in [0081] of the published application US2007/0020189, which corresponds to the paragraph beginning at page 14, line 32, in the specification as filed. See the Office Action, page 2. Applicant has amended the specification to correct this inadvertent error.

Rejection under 35 U.S.C. § 112, Second Paragraph

The Examiner rejects claim 33 for being indefinite. See the Office Action, page 2. According to the Examiner, the term "high temperature" in the phrase "high temperature kiln dried" recited in claim 33 is unclear. Applicant respectfully disagrees.

Applicant submits that the meaning of the phrase "high temperature kiln dried" is well understood in the art. A skilled artisan would readily understand that this phrase refers to kiln drying of timber at temperature above 100°C, e.g., 120°C or higher. This

drying process is used to produce substantially dry substrate or lumber. See, page 18 of "Drying" (downloaded from the website of The New Zealand Pine Manufacturers Association Inc. at http://www.pine.net.nz/faqs/userguide/6%20Drying.pdf; copy attached as "Exhibit A").

In view of the above remarks, Applicant submits that claim 33 is clear. Reconsideration and withdrawal of this rejection are respectfully requested.

Rejection under 35 U.S.C. § 103

The Examiner rejects claims 32-85 for being obvious on various grounds. Applicant addresses the grounds separately below.

I

The Examiner rejects claims 50, 51, 54-63, 66-72, and 76-83 for being obvious over US Patent 6,248,402 ("Guyonnet") in view of US Patent 6,596,975 ("Vinden"). See the Office Action, page 3. Applicant notes that claims 66-72 and 76-83 have been canceled.

According to the Examiner,

> ... Guyonnet teaches the process of treating wood by impregnation comprising the steps of providing a lignocellulosic substrate (wood/lumber, see abstract), heating a target zone (col. 2, lines 5-14), and applying a composition to the substrate (col. 2, lines 18-21). Guyonnet is silent regarding radio or microwave energy heating and the substrate being 15% moisture content or below (claim 50) or green wood (claim 66). Vinden teaches a pre-treatment step of microwave radiation for preparing wood for impregnation (see abstract), wherein the wood is at 15% moisture content (see abstract), or green wood (col. 2, line 50). It would have been obvious to one of ordinary skill in the art to have included a pre-treatment step of microwave radiation in the process of Guyonnet on the disclosed substrates taught by Vinden because Vinden teaches that this pre-treatment step helps prepare wood for impregnation (col. 1, lines 12-15) and works best on wood with 15% moisture content or more (such as green wood). See the Office Action, pages 3-4.

Applicant respectfully traverses with regard to currently amended claims.

Amended claim 50 covers a method of delivering a composition to a lignocellulosic substrate. The method includes heating a target zone of the substrate using radio frequency energy or microwave energy, and applying a composition to a

surface of the substrate including or immediately adjacent to the target zone. The lignocellulosic substrate has an initial moisture content of **less than 15%** as a weight proportion of dry weight and the composition is at a temperature below that of the target zone of the substrate. In other words, the claimed method uses a **substantially dry** lignocellulosic substrate as starting material.

Guyonnet teaches a process of impregnating wood with a hardening product that includes a step of heating the wood. See, column 1, lines 10-12. The heating step requires very high temperatures in the range of 220°C -280°C. See Guyonnet, column 2, lines 28-29. As the Examiner acknowledges, Guyonnet fails to teach, *inter alia*, heating a target zone of the wood using radio frequency energy or microwave energy, or that the wood has an initial moisture content of less than 15%. See the above-quoted passage.

Vinden teaches using microwave energy to heat wood. According to the Examiner, a skilled artisan would have modified the process described in Guyonnet by treating the wood with microwave energy to arrive at the claimed method. Again, see above-quoted passage. Applicant disagrees.

Applicant submits that Vinden would have led a skilled person **away** from the claimed method. According to Vinden, the starting wood used in the process described therein must have a moisture content of **at least 15%**, but more preferably **30%-200%**. See, column 2, lines 47-58. This reference explains that its process requires in the wood a moisture content that is converted to steam. See, column 2, lines 59-63. In other words, Vinden **teaches away** from applying microwave energy to substantially dry wood having a moisture content of less than 15%, as required by amended claim 50.

Moreover, Guyonnet teaches heating wood at extremely high temperatures, i.e., 220°C -280°C, which would be expected to evaporate moisture from the wood, thus resulting in very dry wood. Thus, a skilled artisan would not have been led to combine the teaching of Guyonnet and the teaching of Vinden to arrive at the method covered by claim 50.

In view of the foregoing remarks, Applicant submits that amended claim 50 is not obvious over Guyonnet and Vinden. By the same token, neither are claims 51 and

54-63, all of which depend from claim 50. Reconsideration and withdrawal of this rejection are respectfully requested.

II

The Examiner rejects claims 52 and 53 for being obvious over Guyonnet and Vinden, further in view of US Patent 5,555,642 ("Rem"). See the Office Action, page 6.

Claims 52 and 53 both depend from claim 50, so are patentable for at least the same reasons set forth above. They further specify the radio frequency used to heat the substrate.

The deficiencies of Guyonnet and Vinden are as discussed above. Rem fails to rectify these deficiencies. The Examiner cites Rem for disclosing treating wood with specific radio frequencies. See the Office Action, page 6. According to Rem, the radio frequencies are used in a "softening stage" and a "drying stage." See, column 3, line 50 through column 4, line 17. The "softening stage" is carried out in the presence of an aqueous medium at an elevated temperature. See, column. 2, lines 25-26. The drying stage then reduces the moisture content which has built up in the wood due to the softening stage, for example, down to a moisture content of about 50%. See, column 3, lines 54-55. Thus, like Vinden, Rem describes a process in which the starting wood material has a high moisture content. Put differently, like Vinden, Rem **teaches away** from the claimed method.

Therefore, claims 52 and 53 are not obvious over Guyonnet, Vinden, and Rem, individually or combined. Applicant respectfully requests reconsideration and withdrawal of this rejection.

III

The Examiner rejects claims 64 and 84 for being obvious over Guyonnet and Vinden further in view of US Patent 4,908,392 ("Kusano"). Note that claim 84 has been canceled.

Claim 64 depends from claim 50, and is therefore patentable for at least the same reasons set forth above. Claim 64 further recite that the composition is an aqueous solution.

The deficiencies of Guyonnet and Vinden are discussed above. Kusano does not remedy these deficiencies. The Examiner cites Kusano merely for disclosing a polymerizable monomer in an aqueous medium. See the Office Action, page 7. This reference does not even mention treating any type of wood, much less heating wood with a moisture content of **less than 15%** with radio frequency energy or microwave energy. Thus, there is nothing in this reference that would have led a skilled artisan to the claimed method.

In other words, claim 64 is not obvious over Guyonnet, Vinden, and Kusano. Reconsideration and withdrawal of this rejection are respectfully requested.

IV

The Examiner rejects claims 65 and 85 as obvious over Guyonnet and Vinden, further in view of US Patent 6,187,387 ("Bolle"). See the Office Action, page 7. Claim 85 has been canceled.

Claim 65 depends from claim 50, so is patentable for at least the same reasons discussed above. It further specifies that the composition is applied to the substrate by one or more of dipping, deluging, spraying, or brushing.

The deficiencies of Guyonnet and Vinden are set forth above. Bolle fails to remedy these deficiencies. The Examiner cites Bolle only for disclosing brushing, dipping, deluging and spraying composition onto wood. See the Office Action, page 7. There is nothing in this reference to suggest, *inter alia*, applying radio frequency energy or microwave energy to any type of wood. In other words, Bolle would not have led a skilled artisan to the claimed method.

In view of the foregoing remarks, claim 65 is not obvious over Guyonnet, Vinden, and Bolle, individually or combined. Applicant requests reconsideration and withdrawal of this rejection.

V

The Examiner rejects claims 73-75 for being obvious over Guyonnet and Vinden, further in view of US Patent 5,447,686 ("Seidner"). See the Office Action, page 8.

Claims 73-75 have been canceled, thereby rendering this rejection moot.

VI

The Examiner rejects claims 32-35 and 38-47 for being obvious over Guyonnet and Vinden, further in view of US Patent 6,345,450 ("Elder"). See the Office Action, page 8.

Claim 32 covers a method of delivering a composition to a lignocellulosic substrate. The method includes heating a target zone of the substrate using radio frequency energy or microwave energy, and applying a composition to a surface of the substrate comprising or immediately adjacent to the target zone. The lignocellulosic substrate is kiln dried and the composition is at a temperature below that of the target zone of the substrate. In other words, the claimed method uses a **substantially dry** lignocellulosic substrate as a starting materials.

The deficiencies of Guyonnet and Vinden are discussed above. See section I. Namely, Vinden teaches away from applying microwave energy to substantially dried wood. Further, a skilled person would have been led away from combining the teachings of Guyonnet and Vinden.

Elder does not rectify these deficiencies. The Examiner cites Elder for disclosing that wood, e.g., green wood, can be kiln dried. See the Office Action, page 9. However, as noted above, given the explicit teaching of Vinden, a skilled artisan would have been led away from applying microwave energy to substantially dried wood.

In view of the foregoing remarks, Applicant submits that claim 32 is not obvious over Guyonnet, Vinden, and Elder, individually or combined. By the same token, neither are claims 33-35 and 38-47, all of which depend from claim 32. Reconsideration and withdrawal of this rejection are respectfully requested.

VII

The Examiner rejects claims 36 and 37 for being obvious over Guyonnet, Vinden, and Elder, further in view of Rem. See the Office Action, page 11.

Claims 36 and 37 both depend from claim 32, so are patentable for at least the reasons set forth above. They further specify the radio frequency applied to the substrate.

The deficiencies of Guyonnet, Vinden, and Elder are discussed above. Rem fails to rectify these deficiencies. As noted in section II above, Rem describes applying radio frequencies to wood with high moisture content. Put differently, Rem **teaches away** from the claimed method.

Therefore, Applicant submits that claims 36 and 37 are not obvious over Guyonnet, Vinden, Elder and Rem, individually or combined. Reconsideration and withdrawal of this rejection are respectfully requested.

VIII

The Examiner rejects claim 48 for being obvious over Guyonnet, Vinden, and Elder, and further in view of Kusano. See the Office Action, page 11.

As claim 48 depends from claim 32, it is patentable for at least the same reasons. Claim 48 further recites that the composition is an aqueous solution.

The deficiencies of Guyonnet, Vinden, and Elder are set forth above. Kusano does not remedy these deficiencies. The Examiner cites Kusano merely for disclosing a polymerizable monomer in an aqueous medium. See the Office Action, page 11. This reference does not even mention treating wood, much less heating kiln dried wood with radio frequency energy or microwave energy. Thus, Kusano would not have led a skilled artisan to the claimed method.

In view of the foregoing, Applicant submits that claim 48 is not obvious over Guyonnet, Vinden, Elder, and Kusano, individually or in any combination. Reconsideration and withdrawal of the rejection are respectfully requested.

IX

Lastly, the Examiner rejects claim 49 for being obvious over Guyonnet, Vinden, Elder, and further in view of Bolle. See the Office Action, page 12.

Claim 49 depends from claim 32, and is thus patentable for at least the same reasons. Claim 49 further recites that the composition is applied to the substrate by one or more of dipping, deluging, spraying, or brushing.

The deficiencies of Guyonnet, Vinden, and Elder are discussed above. The Examiner cites Bolle only for teaching brushing, dipping, deluging and spraying composition onto wood. See the Office Action, page 12. There is nothing in this reference to suggest applying radio frequency energy or microwave energy to any type of wood. In other words, Bolle would not have led a skilled artisan to the claimed method.

Therefore, claim 49 is not obvious over Guyonnet, Vinden, Elder, and Bolle, individually or combined. Applicant requests that the Examiner reconsider and withdraw this rejection.

CONCLUSION

It is believed that all of the pending claims have been addressed. However, the absence of a reply to a specific rejection, issue or comment does not signify agreement with or concession of that rejection, issue or comment.

In addition, because the arguments made above may not be exhaustive, there may be reasons for patentability of any or all pending claims (or other claims) that have not been expressed.

Finally, nothing in this paper should be construed as an intent to concede any issue with regard to any claim, except as specifically stated in this paper, and the amendment of any claim does not necessarily signify concession of unpatentability of the claim prior to its amendment.

The Petition for Extension of Time fee in the amount of $555 is being paid concurrently herewith on the Electronic Filing System (EFS) by way of Deposit Account authorization. Please apply any other charges or credits to Deposit Account No. 50-4189, referencing Attorney Docket No. 65501-002US1.

Respectfully submitted,

Date: April 15, 2011

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EXHIBIT A

Exhibit A

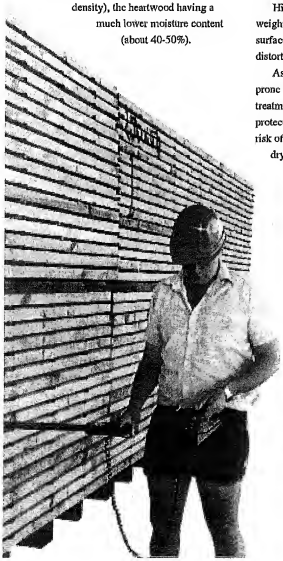
DRYING

New Zealand pine is one of the easiest wood species to dry. With appropriate drying equipment, it can be dried rapidly with little degrade. However, wood from close to the centre of the log (corewood) can tend to twist because of spiral grain. If the wood is correctly dried to, and installed at, the appropriate moisture content for the end use, it will be stable in use.

DRYING PROPERTIES

The properties of New Zealand pine that affect its drying can be summarised as follows.

The wood is predominantly sapwood of high moisture saturation (moisture content 100-220%, depending on the density), the heartwood having a much lower moisture content (about 40-50%).



The sapwood is highly permeable and, therefore, capable of drying rapidly. Heartwood, although less permeable, has a lower initial moisture content and drying takes slightly less time than for the sapwood. The high initial moisture content and rapid drying may cause difficulties where drying equipment has insufficient heating, airflow, or venting capacity.

New Zealand pine is harvested exclusively from plantations, and can vary from about 25 years to 35 years old when felled.

The wood is of moderate density. Wood from within the first 10 rings of growth (juvenile wood or corewood) presents a special warping problem as spiral grain can cause twist.

High-temperature drying and stack weighting of 500-1000 kg/m² of stack surface, should be used to reduce the distortion of this material.

As with most species, the sapwood is prone to infection by fungi. Anti-sapstain treatment is essential for short-term protection against stain and mould. The risk of infection by decay fungi during air drying, especially with large-section lumber or round produce, must be minimised. Kiln drying, if carried out very soon after sawing, will avoid the need for anti-sapstain treatment. Dry lumber will not be infected by stain and mould fungi, provided it is kept dry.

Water-borne preservatives are widely used to offset the low natural durability of New Zealand pine. Pressure preservation processes using copper-chrome-arsenate (CCA) preservatives, change the drying properties of the wood markedly, and re-drying after treatment is slower and more difficult, and gives a more variable final moisture content.

The performance of any wood species used for the manufacture of high quality products is greatly influenced by moisture content. It must be properly dried or it will shrink & twist. New Zealand pine is no exception.

Drying

Kiln Drying Summary Table For 50 mm Thick Lumber

	Low temperature kiln*	Conventional kiln	Accelerated conventional kiln	High temperature kiln
	40-60	70-80	80-100	120-140
	1.5	3.0	4.5	5.0-8.0
	15 days	5 days	2.5 days	13-20 hours
	10-11	6	3	2
	low	high	medium	low
	2,000	3,600	6,000	18,000
	average	skilled	skilled	skilled
	low	high	high	medium
	no	yes	yes	yes
	generally not required	required (in kiln)	required (in kiln)	required (separate chamber)
	no	possible	yes	yes

Typical conventional drying schedule for 50 mm thick New Zealand pine.

	Kiln conditions	Time (hours)	Remarks
	90°C/90°C	4	Vents closed during heat up
	50°C/60°C	36-48	Until target moisture content reached
	100°C/100°C	2-3	Vents closed (time on setting)
			At least three times

[illegible] weights of 600 kg/m³ should be used and left on during the cooling down period of at [illegible]

Drying Methods

A full range of drying methods can be used for New Zealand pine, from air drying to high-temperature kiln drying. These methods can be classified simply in terms of drying temperature.

- Ambient temperature drying – air drying and forced air drying.
- Low temperature dryers (up to 60C, usually 40-50°C) – heated forced-air dryers and low temperature kilns including most heat pump dryers (dehumidifiers).
- Conventional kilns (usually temperatures of 60-80°C for New Zealand pine).
- Accelerated conventional-temperature kilns operating at temperatures of 80-100°C.
- High temperature kilns (temperatures above 100°C, usually 120°C or higher).
- Vacuum drying, which is new to New Zealand, offers the potential of rapid drying and minimising discoloration of high quality lumber.

Drying Practices

Air drying – The lumber stacks should be at least 300 mm above the ground, separated by 300-400 mm, and aligned parallel to the prevailing wind to promote rapid drying. Fillets should be of uniform thickness between 19 and 25 mm, and evenly spaced and aligned.

Warping and surface checking are adequately controlled by good stacking, avoiding overhanging ends, and using stack covers.

Low-temperature drying – This includes heat pump dryers and dehumidifiers.

Preliminary air drying to 60% moisture content reduces the drying time, lessens the risk of moulds and fungal stains, and results in a more uniform final moisture content. An airflow of at least 1.5 m/s is required and for heat pump dryers the compressor size may need to be increased above that normally used to 0.5 kW/m³ of lumber to avoid prolonged drying times with lumber green off the saw. Stress relief is not possible with this drying method.

Conventional kiln drying – Design requirements associated with the higher operating temperatures of these dryers are an increase in the heat input rate, venting capacity and airflow, and airflow reversal capability. These features are necessary to avoid slow and uneven drying. An airflow of 3 m/s or higher is required. The recommended kiln schedules involve a single step with EMC of 8-9% for untreated lumber or for lumber treated by boron. Lumber preservative treated with CCA requires a multi-stepped schedule.

When final moisture contents are to be lower than 12%, final wet-bulb depressions of 15-20°C should be used during the later stages of drying.

At the end of drying, it is essential that the lumber be given an effective final steam conditioning to relieve drying stresses and reduce the moisture content variation within and between pieces. Steaming should be done at 5°C above the final dry-bulb setting, with maximum possible relative humidity. Steaming time should be four hours per 25 mm thickness.

Accelerated conventional-temperature drying – Structural and furniture grade lumber can be dried using these schedules. The permeability of New Zealand pine permits the use of higher temperatures and airflows to reduce drying time while maintaining quality. Successful drying can be achieved by:

- Heat up period 2-4 hours.
- Air flow at least 4.5 m/s.
- Final steam conditioning at 100°C, 100% relative humidity for 2 hours per 25 mm thickness.
- Stack weights 500 kg/m².

If surface checking occurs, a more mild multi-stepped schedule should be used.

High temperature drying – Most widths of 25 mm and 50 mm thick lumber can be dried at high temperature with extremely rapid drying rates.

High temperature drying of furniture grade lumber should not be undertaken on a day-to-day commercial basis unless a very high standard of kiln operation can be maintained. High temperature drying is not recommended for sawn squares or pressure-treated lumber, unless it is to be used for construction purposes where the increased incidence of surface and internal checking may not be important. Kiln construction must be of a high standard, with fan capacity sufficient to achieve a uniform airflow of at least 5 m/s through the load, and heating system sufficient to reach operating temperature in 2 hours and maintain the drying conditions thereafter. Increasing the air flow to 8 m/s will reduce drying times by a further 20%. A final period of steam conditioning is essential to relieve drying stress and reduce the variability of final moisture content.

For successful conditioning, the lumber must first be allowed to cool to below 100°C, but conditioning must be started within 12 hours of the finish of drying. It is important that fully saturated steam is used. Careful kiln stacking is essential and top weights of at least 500 kg/m² are recommended to control warping in the top layers. Weights of 1000 kg/m² are essential for drying lumber containing corewood. The weights should be left in place during conditioning and a 24-hour cooling period.

STORAGE & HANDLING

In common with most species of wood, dry New Zealand pine, especially at moisture contents below 15%, can rapidly pick up moisture on exposure to air. Exposure of dried lumber, in particular after kiln drying, must be minimised.

This means that:

- Kiln stacks must be defilleted within 24 hours of the finish of drying, then block-stacked, and stored under cover. Although it is possible to protect dried lumber by using tarpaulins, sheds are preferable as they are more effective in preventing rain wetting. They should be sufficiently air tight to minimise air exchange.
- If long storage periods are anticipated, individual packets of kiln-dried lumber should be wrapped in plastic.

Careful handling of New Zealand pine lumber, especially during transport, will minimise damage. This means that:

- High value lumber must always be protected either by covers or wrapping. Packets containing lumber of different lengths should be formed so that the short lengths are securely housed within the body of the packet.
- Where wire strapping is used, protective corner shields should be used to prevent the wire cutting into the lumber.
- Adequate support should be provided to the lumber packets to minimise any induced distortion or breakage.

Drying

Radiata Correction Figures For Electrical Moisture Meters

Meter type	Type of wood & Treatment	Meter reading *(calibrated for North American Douglas fir)*													
		8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
Resistance	Untreated wood	10	11	12	12	13	14	15	16	17	18	19	20	21	22	23
	Boron treated timber	9	10	11	11	12	12	13	13	14	15	16	16	17	18	19
	LOSP treated timber	–	–	10	11	12	12	13	14	14	15	16	17	18	19	19
Capacitance (Wagner Model 800)	Untreated wood	12	13	14	15	16	17	18	18	20	20	21	22	23	24	25

Moisture Measurement

There are two main methods to determine the moisture content of New Zealand pine lumber:

- The standard oven drying method.
- Use of electrical moisture meters.

The oven-drying method is quite accurate, provided the lumber has not been treated with organic solvents and is not highly resinous. One of the main disadvantages of this method is the length of time required for a result. Oven drying can be speeded up by using thin samples and a microwave oven.

In the range from approximately 6% moisture content to 24%, electrical resistance and capacitance moisture meters can be used. Most meters are calibrated for one species and must be corrected for other species and treatments.

The correction figures given here for treated and untreated New Zealand pine are for resistance meters which are calibrated to the following standard resistance relationship: 8% - 5,010 M, 12% - 180 M, 16% - 19M.

Recommended Moisture Content For Interior Woodwork In Intermittently Heated Buildings

Average mc (%)	Country	Average mc (%)
12	United States	
10	West Coast	11
8	Nevada/Utah	6
7	Gulf/Southeast	11
10-11	Other states	8
13	Canada	
12	Vancouver	8
	Montreal	5
	Continental Europe	10
	United Kingdom	11

Moisture Content Targets

There are two main drying situations:

- Final moisture content less than 19%, to minimise degrade from moulds and fungi, and provide some guarantee of stability for structural products.
- Final moisture content in the range 5-15% depending on the equilibrium moisture content (EMC) of the end use situation.

In drying to below 19%, either air or kiln drying can by used. However, the low final moisture contents (less than 15%) necessary for high-quality uses can be obtained only by kiln drying. The required final moisture content will depend on a number of factors, and appropriate standards should be consulted.